

বিদ্যাসাগর বিশ্ববিদ্যালয়

VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examination 2023

(Under CBCS Pattern)

Semester — II

Subject : CHEMISTRY

Paper : C-4T

(Organic Chemistry—II)

Full Marks : 40

Time : 2 hours

*Candidates are required to give their answers
in their own words as far as practicable.*

The figures in the margin indicate full marks.

Answer from **all** the Groups as directed.

GROUP—A

1. Answer **any five** questions from the following :

2×5=10

(a) Write the differences between torsional
angle and dihedral angle.

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(Turn Over)

(2)

- (b) Give an example of (i) an asymmetric allene and (ii) molecule having stereogenic centre but achiral.
- (c) Draw the conformational energy diagram of chloroethane with respect to C—C bond.
- (d) *N,N*-dimethylation of aniline triples the basicity of aniline but *N,N*-dimethylation of 2,6-dimethylaniline increases its basicity by 30000 times. Explain.
- (e) Butane-2,3-dione remains almost cent percent in keto form but cyclopentane-1,2-dione remains almost cent percent in enol form. Explain.
- (f) *D* and *L* stereoisomers are not necessarily enantiomers. Illustrate your answer with suitable examples.
- (g) Comment on the chirality and optical activity of $\text{CH}_3\text{CH}_2\text{CH}_2\text{N}(\text{CH}_3)\text{CH}_2\text{CH}_3$ and its corresponding *N*-oxide.
- (h) How can E1cB pathway be distinguished from the kinetically indistinguishable E2 pathway?

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(3)
GROUP—B

Answer any four questions from the following :

5×4=20

2. (a) Compare the basicities and nucleophilicities of NH_3 , NH_2NH_2 and NH_2OH with suitable explanation. 3
- (b) Hydrolysis of methyl iodide takes place at a much faster rate in presence of sodium iodide. Explain with energy profile diagram. 2
3. (a) Write the structures of keto and stable enol forms of 2,4-pentanedione. 1
- (b) What are the factors that stabilize these enol forms? 2
- (c) Account for the observation that enol content of this dicarbonyl compound is 92% in *n*-hexane and 15% in water. 2
4. (a) Give the products with the configurational descriptor (R/S), in the following reactions. Explain their formation mechanistically. 3
- (R)-2-Bromopropanoic acid $\xrightarrow{\text{Conc. NaOH}}$?
- (R)-2-Bromopropanoic acid $\xrightarrow{\text{Moist Ag}_2\text{O}}$?

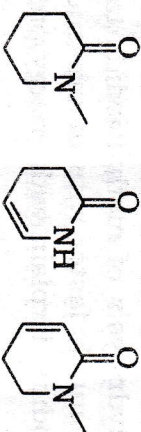
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(4)

(b) Account for the observation that in DMSO the order of reactivity of halide ions with methyl bromide is $F^- > Cl^- > Br^- > I^-$, which is opposite to that observed in methanol solution. 2

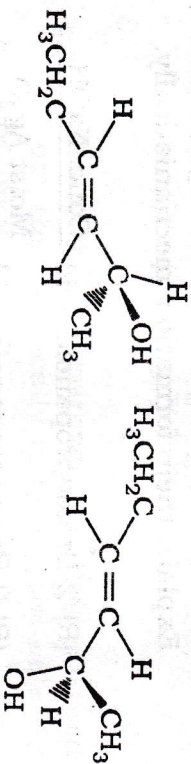
5. (a) Arrange the following amides in increasing order of basicity : 3



(b) (E)-isomer of $HO_2CHC \equiv CHCO_2Na$ is a stronger base than its corresponding (Z)-isomer. Explain. Also comment on their relative acidities. 2

6. (a) How would you resolve (+/-) $CH_3CH(OH)CH_2CH_3$? 2

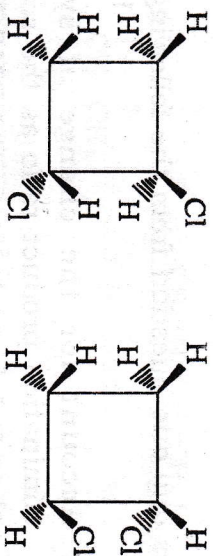
(b) Label the following pairs of the compounds as homomers, enantiomers and diastereomers : 2



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(5)



(c) What is Troger's base? 1

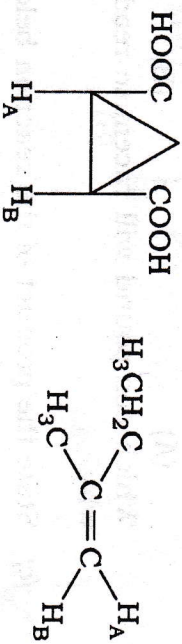
7. (a) $CH_3CHClCH_3$ and $CH_3CHClCH_2Cl$ show kinetic isotope effect during : 3

(i) Substitution reaction using CH_3COOAg/CH_3COOH and

(ii) Elimination reaction using $NaOMe/DMSO$

Indicate the primary/secondary nature of the kinetic isotope effect in the above reactions explaining the variation of rate.

(b) Identify H_A and H_B in each of the following structures as homotopic, enantiotopic and diastereotopic ligands. 2



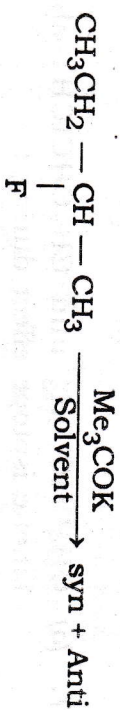
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Answer any one question from the following :

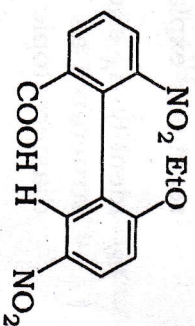
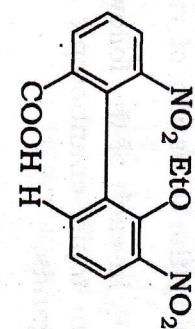
10×1=10

8. (a) Account for the change of syn/anti elimination product ratio as the solvent is changed from benzene to DMSO in the following case : 3



Solvent	Syn	Anti
Benzene	80%	20%
DMSO	20%	80%

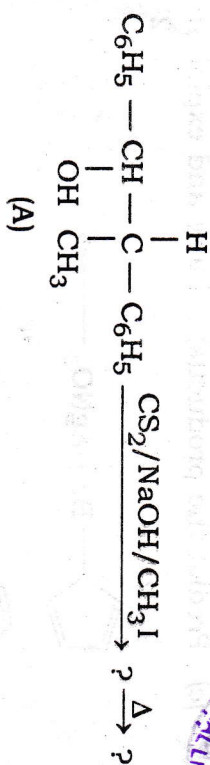
- (b) Predict the R/S nomenclature of the following compounds A and B. 2+1=3



Which compound will racemise readily and why?

- (c) State the product of the reaction below with erythro and threo isomer of (A) : 3

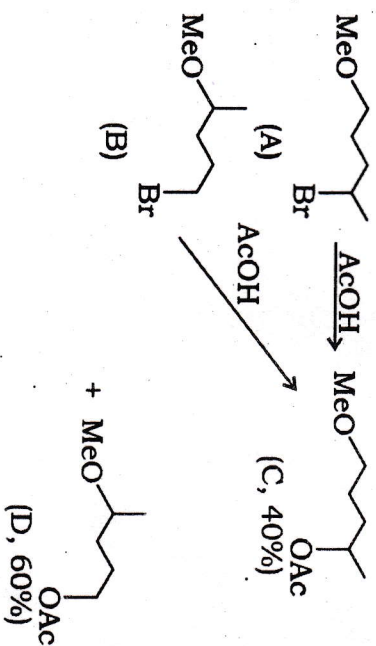
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- (d) Represent $\text{CH}_3\text{COC}_2\text{H}_5$ in Re-face. 1

9. (a) Explain the stereoisomerism of 6,6'-dinitrodiphenic acid and draw the energy profile diagram for racemization of its enantiomers on heating. Label each maximum and minimum with appropriate rotamers. 3

- (b) Account for the fact that isomeric bromoethers (A and B) undergo solvolysis in acetic acid to give same mixture of products (C and D). 2

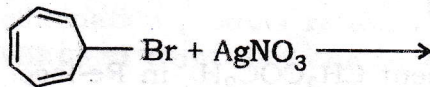
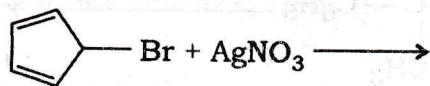


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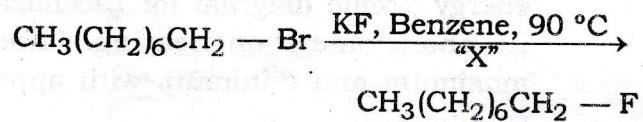
(8)

(c) Predict the product(s) ; if any and explain :

2



(d) Without "X", the following reaction does not proceed. 1+2=3



What is "X"? Explain its role in the reaction mentioned.

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